The microscopic examination of the samples was made by H. E. Merwin of this Laboratory.

RECAPITULATION

Under certain conditions steam is capable of oxidizing iron and its lower oxides to magnetite, Fe_3O_4, or to ferric oxide, Fe_2O_3. This fact has often been quoted as an indication of the probable oxidizing action of steam upon lava during volcanic activity. In this paper this reasoning from analogy is subjected to the light of recent investigations and found wanting. In addition, some experimental results are given which confirm the view that the ferrous iron is not thus oxidized, and indicate that the presence of much ferrous iron in the lava and much steam in the volcanic emanations of Kilauea are two facts which are in full accord. Several miscellaneous experiments are also reported which show that in the experimental study of the chemistry of the lavas careful attention must be paid to the character of the gas phase in contact with the lava if results of value are to be obtained. The bearing of these experiments upon the interpretation of the results obtained by pumping gases from rocks at high temperatures need only be mentioned.

BOTANY.—*History of the Mexican grass*, Ixophorus unisetus. A. S. HITCHCOCK, Bureau of Plant Industry.

In 1791 Thaddeus Haenke, a Bohemian botanist accompanying Malaspina on an exploring expedition to the Pacific coast of America, visited Mexico, stopping at San Blas and Acapulco. From the latter place he visited the interior of the country. His collections were sent to Prague and were examined by the botanists J. S. Presl and C. B. Presl, who finally published an account of a few families, including the grasses,[1] under the title, *Reliquiae Haenkeanae*. In this work 15 genera and about 250 species of grasses were described as new. They came from the western coast of South America, Panama, Mexico, Monterey (California), Nootka Sound (Vancouver Island), and the Philippine and Marianne Islands. Some of the species, supposed to be new, proved to be the same as others previously described,

[1] PRESL, Rel. Haenk. 1: 207–349, pl. 37–48. 1830.

but a large number are still maintained as valid. The plants were deposited at the Bohemian Museum but, when the German University was established, the collections were divided, a part going to each institution. In 1907 the writer found a part of the Haenke grasses at the Bohemian Museum and a part at the German University. The labels on the specimens are meager, usually merely a single word, such as Mexico, Panama, Acapulco, and sometimes even this lacking. There is not always an agreement between the label on the specimen and the locality as published by Presl, and in a few cases there is evidence that the labels have been misplaced.

The grass under consideration was described as *Urochloa uniseta*. The genus Urochloa was based upon *Urochloa panicoides*,[2] a species of Panicum from Île de France (Mauritius), referred to later in this article. This species has the spikelets in one-sided spikelike racemes with one or two slender stiff hairs on the pedicel below the spikelets. In Presl's species the spikelets are in similar one-sided spikes and are subtended by bristles, a single one below each spikelet, these bristles being, however, sterile branchlets instead of hairs or trichomes as in *Urochloa panicoides*. The locality of *U. uniseta* as published is merely Mexico. The type specimen, at the German University, is labeled, "Urochloa uniseta Pr. Mexico, H." It is the upper part of a culm bearing three leaves and a panicle of about 20 spikes.

In 1834 Trinius, in revising the section Setaria of the genus Panicum, remarked that Presl's *Urochloa uniseta*, which apparently he had not seen, probably belonged in Setaria and named it *Panicum unisetum*.

In 1862 Schlechtendahl revised Setaria and its allies and established the genus Ixophorus, basing it upon *Urochloa uniseta* Presl. He also mentioned a specimen collected by Schiede, which he called *I. schiedeana*. This species is not described, the author merely saying that it is more delicate and the bristles are thinner and longer.

In 1886 Fournier, who wrote an account of the grasses of Mexico, described a new species of Setaria, which he called *S. cirrhosa*,

[2] Beauv. Ess. Agrost. 52. pl. 11. fig. 1. 1812.

based upon a specimen (No. 387) collected at San Agustin (Oaxaca) by Liebmann, a Danish botanist, who made extensive collections in Mexico (Vera Cruz and Oaxaca). The type specimen of this species was kindly sent for examination by the Director of the Botanical Museum at Copenhagen. It proves to be the same as *Ixophorus unisetus*. The specimen bears, in Fournier's handwriting, the name *Panicum cirrhosum* Fourn. n. sp., a name which, in publication, he changed to *Setaria cirrhosa*.

The species just mentioned is the fifth species of Setaria in Fournier's account. His sixth is *Setaria uniseta*, based upon *Urochloa uniseta* Presl. As number seven he lists without description *Setaria schiedeana*, based on *Ixophorus schiedeanus* Schlecht., stating that he has not seen this and that Schlechtendahl does not describe it, thus inflicting on the botanist another nomen nudum.

Thus the species remained until 1893, when several manuscript descriptions of Dr. George Vasey were published after his death. Under the name *Panicum* (*Ptychophyllum*) *palmeri* Vasey is published a new species based on a specimen collected by Dr. E. Palmer at Tequila, Jalisco, in 1886. Vasey remarked that this is near *Setaria cirrhosa* Fourn. Vasey referred this to the section Ptychophyllum of Panicum because of the single bristle below the spikelets, because of the inflorescence, which resembles that of *P. sulcatum*, and perhaps because of the rather broad blades.

In 1895 Dr. J. N. Rose published an account of the plants collected in Mexico by Dr. E. Palmer in 1890 and 1891. Among the grasses is a new species credited to Dr. Vasey, *Panicum* (*Ptychophyllum*) *pringlei*. The specimens mentioned are *Pringle* 2047 and 2423, and *Palmer* 1256 in 1891. All are small forms of *Ixophorus unisetus*. Because of the specific name and because Dr. Vasey has written the name upon *Pringle* 2423, this specimen is the type.

In 1896 Beal published the same species as new under the name *Panicum schiedeanum* "Trin. ex. Steud. Nom. Ed. 2, 2: 263 (1841). P. Pringlei Vasey in ed.," basing it on Pringle's No. 2423 from Jalisco, which is the type of *Panicum pringlei*. Beal

uses the name *P. schiedeanum* because it appears on the printed labels of the plants distributed by Pringle (No. 2423). The citation given by Beal, however, is a nomen nudum (a name without description or citation of a synonym). A specimen in the Trinius Herbarium labeled *Panicum schiedeanum* is a species of Paspalum. Beal gives *Panicum palmeri* Vasey on a succeeding page as a distinct species.

In 1897 Scribner revised the genus Ixophorus, describing *I. unisetus*, *I. pringlei* Scribn. "(*Panicum schiedeanum* Beal, not Trin.)," and *I. pringlei* var. *minor* Scribn.

The descriptions of the forms do not differ except in the size of the vegetative parts, the specimens assigned to *I. pringlei* being smaller, the blades shorter and narrower, and the spikes fewer and shorter. The variety is a still more depauperate form, with blades only 1 to 3 inches long (*Palmer* 1256 in 1891 from Colima, Mexico).

Finally, in 1900, Scribner and Merrill, in their revision of the genus Chaetochloa (Setaria), listed among the excluded species *Setaria cirrhosa* Fourn. (see above), which they refer to *Panicum* as *P. cirrhosum*. In this they depended upon Fournier's description as they had not seen the single collection cited by him.

The above account of the nomenclatorial history of a little-known species is instructive as showing how variable are the judgments of different botanists, or of the same botanist at different times, when working with inadequate material. The single species has been described under five different specific names and has been referred to four genera. Fournier had not seen Presl's specimen and American authors had not seen Fournier's nor Presl's specimens. Only recently has there been sufficient material to confirm the judgment that all the forms belong to one species.

A peculiarity of the sterile palea is worthy of note. At first the margins, wide and thin, overlap and inclose the three large anthers of the sterile or lower floret. At maturity the margins expand and spread around the sterile lemma, appearing winglike and papery. This expansion appears to be rather sudden as it is observed only in specimens with fruiting spikelets.

Ixophorus unisetus is cultivated in Costa Rica as a forage grass under the name of Honduras grass (Zacate de Honduras).

The synonymy of the species and a list of the specimens in the National Herbarium follow:

IXOPHORUS UNISETUS (Presl) Schlecht.

Urochloa uniseta Presl, Rel. Haenk. 1: 319. 1830.

Panicum unisetum, Trin. Mem. Acad. St. Pétersb. VI. Sci. Nat. 1: 217. 1834.

Ixophorus unisetus Schlecht., Linnaea 31: 421. 1862.

Ixophorus schiedeanus Schlecht. Linnaea 31: 421. 1862.

Setaria schiedeana Fourn., Hemsl. Biol. Centr. Amer. Bot. 3: 505. 1885.

Setaria uniseta Fourn., Hemsl. Biol. Centr. Amer. Bot. 3: 506. 1885.

Setaria cirrhosa Fourn., Mex. Pl. 2: 43. 1886.

Panicum palmeri Vasey, Contr. U. S. Nat. Herb. 1: 281. 1893.

Panicum pringlei Vasey, Contr. U. S. Nat. Herb. 1: 363. 1895.

Panicum schiedeanum Trin., Beal, Grasses N. Amer. 2: 119. 1886.

Ixophorus pringlei Scribn., U. S. Dept. Agr. Div. Agrost. Bull. 4: 6. pl. 2. 1897.

Ixophorus pringlei minor Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 4: 7. 1897.

Panicum cirrhosum Scribn. & Merr., U. S. Dept. Agr. Div. Agrost. Bull. 21: 40. 1900.

DISTRIBUTION

SAN LUIS POTOSÍ: Rascon, *Purpus* 5425.

TEPIC: Acaponeta, *Rose* 14253.

JALISCO: Tequila, *Palmer* 372 in 1886. Valley of the Río Grande de Santiago, *Pringle* 2423. Near Guadalajara, *Pringle* 2047.

MORELOS: Trimenta, *Orcutt* 4407. Valley of Cuantla, *Pringle* 8493. Cuernavaca, *Hitchcock* 6821, 6841.

COLIMA: Colima, *Palmer* 141 in 1897, 1256 in 1891. Alzada, *Hitchcock* 7070, 7091. Jala, *Hitchcock* 7007.

GUERRERO: Iguala, *Hitchcock* 6695. Balsas, *Hitchcock* 6805.

GUATEMALA: Patulul, *Heyde & Lux* 6401.

SALVADOR: San Salvador, *Renson* 301, 362. Sonsonate, *Hitchcock* 8977.

NICARAGUA: Corinto, *Hitchcock* 8614. Realejo, *Hitchcock* 8750.

COSTA RICA: Guadelupe, *Tonduz* 14480 (cultivated).

In a preceding paragraph it was stated that the genus Urochloa, to which *Ixophorus unisetus* was first referred, was based upon a single species, *U. panicoides* Beauv. (1812). A few years later (1816) Poiret described the same species as *Panicum javanicum*. In 1821 Trinius, in an article entitled *Agrostographische Beyträge*,[3] published an allied species from the East Indies, as *Panicum helopus*. Later authors confused the two species and Hooker in his *Flora of British India* unites them under the name *P. javanicum*. This author, who is much given to placing under one name several allied species, makes the following statement under *P. javanicum:* "Kunth (Revis. Gram. 1. 206) says, under *Urochloa panicoides*, that he has examined in Desfontaine's Herbarium the type of Poiret's *P. javanicum*, and identified it, which he cites as a syn. of *Urochloa panicoides*, but his figure of which again quite accords with a narrow-leaved form of *P. helopus*, Trin. This requires the adoption of the name *javanicum* (by misprint *japonicum* in Kunth Revis.) for the species. Bentham, on the other hand (*Fl. Austral.*, vii 477), says that Munro has seen an authentic specimen of *javanicum*, and that it is quite distinct from *P. helopus*. I have no means of verifying either authority." The original description of *P. javanicum* states that the spikelets are glabrous; the original description of *P. helopus* states that the spikelets are hirsute. Beauvois's figure, accompanying the original description of *Urochloa panicoides*, shows the spikelets to be glabrous. Thus one can easily distinguish the two species without consulting the evidence of which Hooker speaks.

The species with glabrous spikelets should be known as **Panicum panicoides** (Beauv.) Hitchc. (*Urochloa panicoides* Beauv. Ess. Agrost. 52. pl. 11. fig. 1. 1812; *Panicum javanicum* Poir. in Lam. Encycl. Suppl. 4: 274. 1816).

[3] Spreng. Neu. Entd. 2: 84. 1821.